**Amendments to the Claims:**

This listing of claims will replace all prior versions and listings of claims in the application:

**Listing of Claims:**

Claims 1-10 are cancelled.

11.(original) A method of forming a magnetic tunneling junction (MTJ) MRAM device with an ultra-thin tunneling barrier layer of high smoothness and breakdown voltage comprising:

providing a substrate having a substantially planar upper surface;

forming a first NiCr seed layer on said substrate;

forming a non-magnetic metal layer on said seed layer;

forming a Ta overlayer on said metal layer and sputter-etching said overlayer;

forming a second NiCr seed layer on said sputter-etched Ta overlayer;

forming an AFM pinning layer on said seed layer;

forming a pinned layer on said pinning layer;

forming a layer of Al on said pinned layer; and

oxidizing said Al layer in a plasma oxidation chamber, by a process of radical oxidation, to form a tunneling barrier layer on said pinned layer, said tunneling barrier layer being ultra-thin, smooth and having a high breakdown voltage as a result of the NiCr seed layer formed on the sputter-etched Ta overlayer; and

forming a free layer on said tunneling barrier layer;

forming an upper capping layer on said free layer.

12.(original) The method of claim 11 wherein all layer formations are by sputtering in an ultra-high vacuum sputtering chamber.

13.(original) The method of claim 11 wherein said first and second NiCr seed layers are formed of NiCr having 35%-45% Cr by number of atoms.

14.(original) The method of claim 11 wherein the metal layer is a layer of Ru formed to a thickness between approximately 250 and 1000 angstroms.

15.(original) The method of claim 11 wherein the overlayer of Ta is formed to a thickness between approximately 60 and 80 angstroms and is then sputter-etched to remove between approximately20 and 30 angstroms of said Ta and to render the sputter-etched surface smooth and amorphous.

16.(original) The method of claim 11 wherein the formation of the synthetic pinned layer comprises:

forming a first ferromagnetic layer, which is a layer of CoFe(10%), to a thickness between approximately 15 and 25 angstroms;

forming a coupling layer of Ru, to a thickness between approximately 7 and 8 angstroms on said first layer;

forming a second ferromagnetic layer, which is a layer of CoFe(25%) or CoFe(50%), to a thickness between approximately 10 and 20 angstroms;

magnetically coupling the two CoFe layers with antiparallel magnetizations.

17.(original) The method of claim 11 wherein the Al layer is formed to a thickness between approximately 7 and 12 angstroms.

18.(original) The method of claim 11 wherein the process of radical oxidation of said Al layer further comprises:

placing the Al layer into a plasma oxidation chamber that includes an upper electrode, a lower electrode and a grid positioned between said electrodes;

placing said Al layer in contact with the lower electrode;

feeding the upper electrode within the chamber with 0.5 liters of oxygen gas while providing power to the upper electrode at a rate of between 500 and 800 watts to produce a shower of oxygen radicals through said grid which impinge on said Al layer.

19.(original) The method of claim 11 wherein the ferromagnetic free layer is formed as a double layer comprising a layer of CoFe formed to a thickness between approximately 5 and 15 angstroms on which is formed a layer of NiFe of a thickness between approximately 20 and 50 angstroms.

20.(original) The method of claim 11 wherein the upper capping layer is formed as a layer of Ru to a thickness of between approximately 200 and 300 angstroms.

Claims 21-29 are cancelled.

30.(currently amended) A method of forming a tunneling magnetoresistive (TMR) read head with an ultra-thin tunneling barrier layer of high smoothness and breakdown voltage comprising:

providing a substrate, which is an NiFe lower shield and conducting lead layer having a substantially planar upper surface;

forming a Ta overlayer on said substrate;

sputter-etching said Ta overlayer, reducing it in thickness and rendering its upper surface smooth and amorphous;

forming an NiCr seed layer on said sputter-etched Ta overlayer;

forming an AFM pinning layer on said seed layer;

forming a synthetic pinned layer on said pinning layer;

forming a naturally oxidized tunneling barrier layer on said pinned layer, said tunneling barrier layer being smooth and homogeneous as a result of being formed on said Ta sputter-etched overlayer and said NiCr seed layer;

forming a free layer on said tunneling barrier layer;

forming an upper capping layer on said free layer; and

forming an NiFe upper shield and conducting lead layer on said capping layer.

31.(original) The method of claim 30 wherein all layer formations are by sputtering in an ultra-high vacuum sputtering chamber.

32.(original) The method of claim 30 wherein said NiCr seed layer is formed of NiCr having 35%-45% Cr by number of atoms.

33.(original) The method of claim 30 wherein the overlayer of Ta is formed to a thickness between approximately 60 and 80 angstroms and is sputter-etched to remove between approximately 20 and 30 angstroms and to render the sputter-etched surface smooth and amorphous.

34.(original) The method of claim 30 wherein the antiferromagnetic pinning layer is a layer of MnPt formed to a thickness of between approximately 100 and 200 angstroms.

35.(original) The method of claim 30 wherein the formation of the synthetic pinned layer comprises:

forming a first ferromagnetic layer of CoFe(10%) formed to a thickness between approximately 20 and 25 angstroms;

forming a coupling layer of Ru on said first ferromagnetic layer, to a thickness between approximately 7 and 8 angstroms

forming a second ferromagnetic layer of CoFe(50%) on said Ru layer, to a thickness between approximately 25 and 30 angstroms.

36.(original) The method of claim 30 wherein the process of forming a naturally oxidized tunneling barrier layer comprises:

forming a layer of Al or a bilayer of HfAl on said pinned layer;

placing said formation into an oxidation chamber;

purging said chamber with oxygen gas at approximately 75 millitorr pressure;

leaving the fabrication in the chamber for approximately 15 minutes.

37.(original) The method of claim 36 wherein said Al layer is formed to a thickness of approximately 5.75 angstroms, as a double atomic layer in the (111) crystal plane and, when oxidized, forms a layer having the wide band-gap of an insulating material.

38.(original) The method of claim 36 wherein the Hf layer of said HfAl bilayer is formed to a thickness of between approximately 1 and 2 angstroms and the Al layer is formed to a thickness of between approximately 4 and 5 angstroms.